

A1 1. (Amended) A sensor element for electrically measuring the position of liquid levels, comprising:

a substrate; and

a plurality of electrodes adapted to be contacted individually and mounted on the substrate, wherein the electrodes comprise sensor-active partial electrodes that are networked with electrical connections, and wherein the partial electrodes of two respective electrodes are always positioned opposite one another, separated by a distance, to form partial electrode pairs, and the electrode pairs thus formed recur periodically over a length of the sensor element.

2. The sensor element according to Claim 1, wherein the electrical connections of the networked partial electrodes are coated with a passivating layer.

3. The sensor element according to Claim 1, wherein the partial electrodes positioned pairwise opposite one another are always at least one of separated by the same distance, and the distances between the partial electrode pairs in the longitudinal direction of the sensor element are constant over the entire length of the sensor element, and/or the number of partial electrode pairs per electrode pair is constant.

4. The sensor element according to Claim 1, wherein the distance between the partial electrode pairs in the longitudinal direction is approximately 100  $\mu\text{m}$ .

5. The sensor element according to Claim 1, wherein the substrate is made of one of silicon, glass, and plastic.

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cont.

6. The sensor element according to Claim 1, wherein the electrodes are made of one of platinum, iridium, and gold.

7. The element according to Claim 1, wherein the sensor chip surface has wetting properties such that the boundaries of the liquid wetting of the sensor surface correspond to the liquid level.

8. An arrangement for measuring a capillary filling, including a sensor element for electrically measuring the position of liquid levels, comprising

a substrate; and

a plurality of electrodes adapted to be contacted individually and mounted on the substrate,

wherein the electrodes comprise sensor-active partial electrodes that are networked with electrical connections, and wherein the partial electrodes of two respective electrodes are always positioned opposite one another, separated by a distance, to form partial electrode pairs, and the electrode pairs thus formed recur periodically over a length of the sensor element, wherein the sensor element is attached to a capillary in such a way that the sensor-active partial electrodes are situated inside the capillary and the electrical connection options are situated outside the capillary, and that at least one conductivity boundary of the capillary filling is located in the region of the sensor element.

9. The arrangement according to Claim 8, wherein two conductivity boundaries of operating liquids in the capillary form a bubble in the region of the sensor element, said bubble being bounded on both sides by the operating liquid.

10. The arrangement according to Claim 8, wherein at least one of the bubble is filled with gas, and the length of the bubble is approximately twice the

AI  
cont.

length of an electrode pair in the longitudinal direction, and the same operating liquid is present on both sides of the bubble.

11. A method for measuring liquid levels using a sensor element for electrically measuring the position of liquid levels, comprising

part B cont.

a substrate; and

a plurality of electrodes adopted to be contacted individually and that are mounted on the substrate, wherein the electrodes comprise sensor-active partial electrodes that are networked with electrical connections, wherein the partial electrodes of two respective electrodes are always positioned opposite one another, separated by a distance, to form partial electrode pairs,

and the electrode pairs thus formed recur periodically over a length of the sensor element comprising the steps of:

determining which electrode pairs are covered and which are not covered by an operating liquid by measuring the resistance of each individual electrode pair in an idle state of the operating liquid;

comparing the resistance values to characteristic minimum and maximum values for liquid coverage or no liquid coverage; and

detecting from this information the position of the conductivity boundary or of the bubble on a specific electrode pair.

12. A method for measuring liquid levels using a sensor element for electrically measuring the position of liquid levels, comprising

a substrate; and

a plurality of electrodes adapted to be contacted individually and mounted on the substrate,

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B cont~~  
wherein the electrodes comprise sensor-active partial electrodes that are networked with electrical connections, and wherein the partial electrodes of two respective electrodes are always positioned opposite one another, separated by a distance, to form partial electrode pairs,

and the electrode pairs thus formed recur periodically over a length of the sensor element comprising the steps of:

comparing the intermediate value lying between the minimum and maximum resistance value of the electrode pair to a reference resistance curve of the electrode pair; and

obtaining the position of the conductivity boundary for a specific partial electrode pair from said step of comparing.

13. The method according to Claim 11, wherein the path distance traveled by the bubble is determined from the detected position of the bubble or of the conductivity boundary before and after movement of the bubble.

14. A method for measuring liquid levels using a sensor element for electrically measuring the position of liquid levels, comprising

a substrate; and

a plurality of electrodes adapted to be contacted individually and mounted on the substrate, wherein the electrodes comprise sensor-active partial electrodes that are networked with electrical connections, and wherein the partial electrodes of two respective electrodes are always positioned opposite one another, separated by a distance, to form partial electrode pairs, and the electrode pairs thus formed recur periodically over a length of the sensor element comprising the steps of:

*A1*  
*conc.*  
jumps in the resistance values upon movement of a bubble by parallel monitoring of the resistance values of all electrode pairs; and

*full*  
*B1*  
*cont.*  
determining the path distance traveled by the bubble from the number of jumps.

15. The method according to Claim 13, wherein the displaced liquid volume is determined from the path distance traveled.

16. The method according to Claim 11, wherein the resistance measurement of the electrode pairs is performed by measuring the resulting current after an alternating current is applied to the electrodes.

17. The method according to Claim 16, wherein the alternating current has a frequency in the kilohertz range and/or an amplitude in the range of 100 millivolts.

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Please add the following new claims:

*A2*  
--18. The method according to Claim 14, wherein the displaced liquid volume is determined from the path distance traveled.

*Subj.*  
*cont.*  
19. The method according to Claim 12, wherein the resistance measurement of the electrode pairs is performed by measuring the resulting current after an alternating current is applied to the electrodes.

20. The method according to Claim 13, wherein the resistance measurement of the electrode pairs is performed by measuring the resulting current after an alternating current is applied to the electrodes.--